

**UNITED STATES DISTRICT COURT  
EASTERN DISTRICT OF TEXAS  
MARSHALL DIVISION**

TECHNOLOGY PROPERTIES LIMITED and  
PATRIOT SCIENTIFIC CORPORATION,

Plaintiffs,

v.

MATSUSHITA ELECTRIC INDUSTRIAL  
CO; LTD; PANASONIC CORPORATION OF  
NORTH AMERICA; JVC AMERICAS CORP.;  
NEC CORPORATION; NEC ELECTRONICS  
AMERICA, INC.; NEC AMERICA, INC.; NEC  
DISPLAY SOLUTIONS OF AMERICA, INC.;  
NEC SOLUTIONS AMERICA, INC.; NEC  
UNIFIED SOLUTIONS, INC.; TOSHIBA  
CORPORATION; TOSHIBA AMERICA,  
INC.; TOSHIBA AMERICA ELECTRONIC  
COMPONENTS, INC.; TOSHIBA AMERICA  
INFORMATION SYSTEMS, INC.; and  
TOSHIBA AMERICA CONSUMER  
PRODUCTS, LLC,

Defendants.

Civil Action No. 2-05CV-494 (TJW)

**JURY TRIAL DEMANDED**

**DEFENDANTS' BRIEF REGARDING CONSTRUCTION OF DISPUTED CLAIM  
TERMS OF THE 336 AND 148 PATENTS**

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## **I. OVERVIEW OF THE 336 AND 148 PATENTS-IN-SUIT**

Patriot and TPL are attempting to assert the 336 patent<sup>1</sup> against virtually every microprocessor, and every consumer electronic product containing a microprocessor, sold today. If a microprocessor has on-chip clock circuitry, and some sort of input/output interface, Patriot and TPL are claiming infringement of the 336 patent. But the named inventors<sup>2</sup> of the 336 patent actually described and claimed a much narrower invention in their patent.

The 336 patent relates to microprocessors, which are incredibly complex circuits that often contain hundreds of millions of transistors fabricated on a single silicon chip. They have thousands of circuits that all must be exquisitely synchronized in order to work together. A system clock provides this synchronization by delivering a clocking signal throughout the circuit. Each time the clock ticks (which may happen every millionth of a second, or even faster), the various parts of the circuit will perform a step. By using a system clock, all of the parts of the massively complex microprocessor can operate in harmony. The faster the microprocessor is clocked, the greater its computing power, and the more useful work it can do in a given time period. See Gafford Decl. ¶ 8.<sup>3</sup>

The problem addressed by the 336 patent is that microprocessors must operate over wide temperature ranges and wide voltage swings, and wide variations in semiconductor processing. These operating and manufacturing parameter variances can cause the processing frequency, or intrinsic “speed limit” of the microprocessor, to change as well. For example, if temperature increases, the processing frequency decreases, so that the microprocessor must be clocked at a lower speed to avoid errors. Accordingly, microprocessors are typically clocked at speeds that are fixed low enough so that they will still function as expected in the worst case scenario—i.e., the worst case temperatures, voltages, and manufacturing variations. As a result, a

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<sup>1</sup> U.S. Patent No. 5,809,336 (“336 patent”), attached hereto as Exh. A.

<sup>2</sup> Defendants refer to Mssrs. Moore and Fish as “the inventors” as a matter of convenience, but reserve the right to contest their status as inventors.

<sup>3</sup> Declaration of Thomas Gafford, attached hereto as Exh. B.

microprocessor will typically be operated much slower than its processing frequency, thereby essentially wasting processing power.

The inventors' proposed solution was to fabricate the entire system clock on the same silicon chip as the microprocessor. According to the 336 patent, by fabricating the entire clock "on-chip" with the microprocessor, the various parameters (temperature ranges, voltage swings, manufacturing variations) that affect the microprocessor's processing frequency will affect the system clock in the same manner. For example, if the temperature drops, the maximum theoretical performance of the CPU increases, and the CPU can safely be run faster. In that instance, according to the patent, the system clock will run correspondingly faster. The on-chip system clock will thus automatically track the processing frequency of the CPU, allowing it to "always [run] at the maximum frequency possible, but never too fast." (336:17:1-2).<sup>4</sup> The patent states this singular purpose for the on-chip clock.

During prosecution, the inventors repeatedly amended their claims in response to Patent Office rejections based on the prior art leaving no doubt that their claimed invention was a microprocessor with a clock entirely on the chip and that the claimed microprocessor did not rely on an external crystal/clock generator or control signal. They also repeatedly stressed that their microprocessor was different from the prior art because its clock speed would automatically track (vary together with) the processing frequency of the microprocessor as parameters such as temperature and voltage changed. Because the industry has not adopted their approach, however, Plaintiffs now advance contrary positions in this case to try to encompass fundamentally different microprocessors.

Patriot and TPL are also asserting the 148 patent against a subset of the 336 patent-accused microprocessors. As does the 336 patent, the 148 patent claims a variable-speed on-chip clock, which has variable output frequency. The 148 patent additionally requires "a memory" that takes up greater than 50% of the physical space on the chip's integrated circuit substrate.

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<sup>4</sup> Patent citations are in the form (Patent Number: Columns: Lines).

Given that the two patents share the same specification, the construction of the 148 patent claims should be consistent with the construction of the 336 claim terms.

## **II. THE INVENTION DESCRIBED BY THE 336 PATENT**

A very limited portion of the patent specification relates to the invention claimed by the 336 patent: the abstract, Figs. 17-19, column 3:26-34, and column 16:43-17:37. The sole embodiment set forth in the patent explains that microprocessors must operate “over wide temperature ranges, wide voltage swings, and wide variations in semiconductor processing” all of which affect the fastest speed at which a microprocessor can safely be run. (336:16:44-53). The specification states that traditional, i.e., prior-art, microprocessors, are clocked at a low enough speed to make sure that they operate properly in the worst case of these parameters. (*Id.*)

The 336 patent proposes the solution of fabricating the system clock on the same chip as the microprocessor, so that the speed of the clock will track the intrinsic processing frequency of the central processing unit (“CPU”) as operating parameters (such as temperature, voltage and process) that can affect such frequency change. Thus, if the CPU processing frequency changes because of these operating parameters, the clock speed will correspondingly change, and the CPU will “always execute at the maximum frequency possible, but never too fast.” (336:16:54-17:2).<sup>5</sup>

In addition, because the microprocessor was running at a different speed than components on different chips with which the microprocessor needed to communicate, the inventors also adopted the well-known method of using a second clock to time the operation of an input/output interface. (*Id.* at 17:19-37).

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<sup>5</sup> The 336 patent proposed using as an on-chip clock circuit “the familiar ‘ring oscillator’ used to test process performance.” (16:56-57). This is a circuit constructed only from transistors and allowed to run at a frequency controlled by environmental parameters, in order to be used as a measure of the intrinsic speed limits of the microprocessor. *See* Gafford Decl. ¶ 17.

### **III. THE INVENTORS SUBMITTED MULTIPLE AMENDMENTS TO THE PATENT OFFICE EXPLAINING EXACTLY WHAT THE 336 PATENT COVERS AND WHAT IT DOES NOT COVER**

The Patent Office rejected the 336 patent four times before it was finally allowed to issue. The inventors were forced to make numerous amendments and made numerous statements about what their patent was intended to cover and not cover. The prosecution demonstrates three fundamental points: (1) the claimed invention does not contemplate a clock that relies on an off-chip crystal/clock generator or a control signal; (2) the claimed invention requires the CPU system clock to track the processing frequency of the CPU; and (3) the claimed invention requires the CPU to run at the “fastest safe operating speed.”

#### **A. The Sheets Patent: First Rejection And Amendment**

In December 1995, the Patent Office rejected all pending claims based on the Sheets prior art patent. See Ex. C at 3 [12/12/95 Office Action]. Sheets discloses a microprocessor (100) with a variable speed system clock, comprising a voltage controlled oscillator (102) (“VCO”). See Ex. D at Figure 1 [U.S. Patent No. 4,670,873 (“Sheets”)].

In response, on April 11, 1996, the inventors amended all the pending claims of the 336 patent application to explicitly recite that the claimed microprocessor comprises “a single integrated circuit including” the system clock. See Ex. E [4/11/96 Amendment]. They also specified that the system clock and the central processing unit of the microprocessor must be made of “a plurality of electronic devices of a like type.” Id. The inventors explained that the claimed CPU would operate “at a variable processing frequency which depends upon a variable speed” of the system clock. See id. at 6-7. The inventors expressly quoted the specification to support this feature: “By deriving timing from the ring oscillator 430, CPU 70 will always execute at the maximum, frequency possible, but never too fast. . . .” Id. at 7 (quoting (336:16:67-17:2)). To emphasize the point, the inventors repeated that their amendments enabled the processing frequency of the microprocessor to track the clock rate of the ring oscillator system clock, and explicitly equated this feature to the further specification statement: “The CPU 70 executes at the fastest speed possible” using the clock 430. Ex. E at 8-9 [4/11/96

Amendment]. Thus, twice in the same amendment, the inventors equated the CPU processing frequency to the fastest safe speed of the CPU.

The inventors further explained that the system of Sheets was “entirely dissimilar” from the invention they were claiming because Sheets describes a microprocessor that has “terminals or pins, such as the CLK and INT terminals of microprocessor (FIG. 1), for receiving inputs from external devices like VCO 12 and fixed oscillator 103.” Id. at 8. Because the Sheets VCO was not on chip, its frequency was adjusted through “a digital word indicative of the desired operating frequency” that was “written by the microprocessor.” The inventors then distinguished their invention from microprocessors that rely on frequency control information from an external clock source:

**The present invention does not similarly rely upon provisioning of frequency control information to an external clock**, but instead contemplates providing a ring oscillator clock and the microprocessor within the same integrated circuit. The placement of these elements within the same integrated circuit obviates the need for provision of the type of frequency control information described by Sheets, since the microprocessor and clock will naturally tend to vary commensurately in speed as a function of various parameters (e.g., temperature) affecting circuit performance. Sheet’s system for providing clock control signals to an external clock is thus seen to be unrelated to the integral microprocessor system of the present invention.

See id. at 8 (emphasis added).

## **B. The Second Rejection And Addition Of “Varying Together” Limitations**

On July 8, 1996, the Patent Office again rejected all claims of the 336 patent application. See Ex. F [7/8/96 Office Action]. Specifically, the Patent Office noted that the Sheets reference disclosed that the system clock was fabricated on the chip. See id. at 4 (“Sheets clearly indicates in lines 46-48 of column 2 that the system 100 shown in Figure 1 is fabricated on a single chip using MOS technology.”).

In response, the inventors further amended their claims, this time to expressly state that the processing frequency of the CPU and the speed of the system clock must be “varying together” due to manufacturing variations, operating voltage, and/or temperature of the

integrated circuit. See Ex. G at 3. [1/13/97 Amendment]. Specifically, they discussed with the examiner “the fact that the operating characteristics of electronic devices in an integrated circuit will track one another depending on variations in the manufacturing process used to make the integrated circuit.” See id. The inventors again pointed to the same specification statements to show this fact in the context of the microprocessor “of this invention,” and stressed that their claimed invention utilizes this fact to allow the microprocessor to operate at its “fastest safe operating speed.” See id. at 3-4. The inventors contrasted over prior art systems that were run at slower “rated speeds.”

The inventors also distinguished Sheets because its on-chip clock circuitry is “driven by an external clock that provides a clock signal to a designated pin of the microprocessor integrated circuit package,” and thus is not entirely on the chip. See id. at 4. They further argued that their invention was different because the speed of their system clock “varies correspondingly with changes in the operating characteristics of electronic devices making up the microprocessor as a result of being in the same integrated circuit as the microprocessor, as claimed.” See id.

The inventors went further and argued that even if Sheets’s variable clock was on-chip, it still did not teach the claimed subject matter, because Sheets required a command input to change the clock speed whereas, “in the present invention, the clock speed varies correspondingly to variations in operating parameters . . . .” See id.

### **C. The Magar Patent: Third Rejection And Amendment**

On April 3, 1997, the Patent Office again rejected the claims of the 336 patent, this time based on a different prior art patent, the Magar patent. See Ex. H at 2 [4/3/97 Office Action]. The Magar reference discloses a microprocessor with a clock generator fabricated on the same silicon chip as the microcomputer. See Ex. I at Fig. 2a [U.S. Patent No. 4,503,500 (“Magar”)]. Magar discloses that the clock generator relies on an external crystal (or external generator) connected to the pins X1 and X2. See Ex. J at 2 [7/7/97 Amendment] (“The chip 10 includes a clock generator 17 which has two external pins X1 and X2 to which a crystal (or external

generator) is connected.”) (citing Magar patent). In this configuration, in which a crystal is placed across the two external pins X1 and X2, the crystal serves as a reference signal for the clock generator to lock onto. See Gafford Decl. ¶ 25. The Patent Office rejected the pending claims over Magar, noting that “[s]ince the microcomputer of Magar is fabricated on a single chip, one of ordinary skill in the art should readily recognize that the speed of the cpu and the clock vary together due to manufacturing variation, operating voltage and temperature of the IC.” See Ex. H at 2 [4/3/97 Office Action].

In response, the inventors once again explained that their claimed invention was different from the prior art because the Magar microprocessor is “driven by a fixed frequency crystal, which is external to the Magar integrated circuit.” See Ex. J at 2 [7/7/97 Amendment]. They explained that Magar was “merely representative of the ‘most microprocessors’ acknowledged as prior art . . . , which prior art microprocessors use a ‘conventional crystal clock.’” Id. at 3. Moreover, the inventors argued that the microprocessor disclosed by Magar would not vary together with the CPU due to manufacturing variation, operating voltage and temperature of the integrated circuit because the clock disclosed in Magar is “frequency controlled by a crystal which is also external to the microprocessor” and thus “in no way contemplates a variable speed clock as claimed.” Id. at 4.

Despite these clear statements, Plaintiffs assert in their brief that the inventors actually intended to cover some external crystals in their invention. That is simply not true. The inventors expressly distinguished conventional, prior-art processors in which a crystal is connected across two pins, such as in Magar, and is caused to oscillate by circuitry contained on-chip. Additionally, they expressly made clear that their invention did not cover other prior-art processors, such as those found in yet another prior art patent, Edwards, in which a crystal is packaged as part of an external oscillator and is connected to a single pin of the CPU. Id. The inventors explained that the use of an external crystal is not within the scope of the patent claims because “[a]ll these systems operate at a **fixed frequency determined by the external crystal.**” Id. (emphasis added).

The inventors also once again expressly distinguished clocks that use various control signals to vary the speed of the system clock. *Id.* at 4-5. Unlike these variable speed clocks, whose output is controlled by a control signal, “crucial to the present invention” is that, “since both the oscillator or variable speed clock and driven device are on the same substrate, when the fabrication and environmental parameters vary, the oscillation or clock frequency and the frequency capability of the driven device will automatically vary together.” *Id.* at 5.<sup>6</sup>

#### **D. The Fourth Rejection And Addition of the “Entire” Claim Limitation**

The Patent Office still remained unconvinced, and on October 16, 1997, it again rejected the claims of the 336 patent in view of Magar. *See* Ex. K [10/16/97 Office Action]. To overcome the prior art, the inventors amended their claims for a third time, clarifying that their claimed invention does not include microprocessors that rely on external crystals. *See* Ex. L [2/6/98 Amendment]. Specifically, they amended all of the claims to add the term “entire” to expressly require that the “entire” system clock be located on the same chip as the microcomputer. *See id.* at 2. They made this amendment “in order to sharpen the distinction over the prior art.” *Id.* at 3.

The inventors explained why Magar does not disclose an “entire” system clock as required by the amended claims:

[T]here would be no ‘tracking’ of the clock rate produced by the Magar clock generator, because the entire circuit is not provided on the integrated circuit. **Magar’s clock generator relies on an external crystal connected to terminal X1 and X2 to oscillate, as is conventional in microprocessor designs. It is not an entire oscillator in itself.** And with the crystal, the clock rate generated is also conventional in that it is at a fixed, not variable, frequency. The Magar clock

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<sup>6</sup> When a patentee uses the term “crucial to,” or “in the present invention,” it has special meaning regarding the scope of the claim. *Honeywell Int’l, Inc. v. ITT Indus., Inc.*, 452 F.3d 1312, 1318 (Fed. Cir. 2006) (limiting the term “fuel injection systems” to only fuel filters where “on at least four occasions, the written description refers to the fuel filter as “this invention” or “the present invention”); *Microsoft Corp. v. Multi-Tech Sys., Inc.*, 357 F.3d 1340, 1351-52 (Fed. Cir. 2004) (construing claim to require feature that was “central to the functioning of the claimed invention[ ]”).

is . . . not at all like the clock on which the claims are based, as has been previously stated.

Id. at 3 (emphasis added).

The inventors left no doubt that the invention required that every part of the clock must be on-chip. Indeed, although most of the clock circuitry disclosed by Magar was on-chip, the inventors argued that this failed to meet the new claim requirement that the “entire” clock be on-chip because the clock generator was connected to an external crystal: “Thus while **most** of Magar’s clock (generator) circuitry is on the IC, the entire oscillator, which because it requires an external crystal, is not.” Id. at 4.

In response to this amendment, as well as an additional supplemental amendment, the Patent Office allowed certain of the claims of the 336 patent.

#### **IV. CENTRAL DISPUTED CLAIM TERMS FROM THE 336 PATENT**

As explained above, the inventors made clear both in their patent specification and in their repeated statements to the Patent Office that their invention was directed to a system clock that was entirely on-chip, and that the clock frequency would vary together with the processing frequency of the CPU as various parameters such as temperature affected the CPU’s fastest speed. Three core claim limitations, which go to the heart of the 336 patent and were required for patentability, are in dispute between the parties: (A) the “entire” clock limitations, (B) the “processing frequency” limitations, and (C) the “varying together” limitations. Plaintiffs offer definitions of these terms that seek to ignore the claim language, the specification, and the many statements made to the Patent Office in order to accuse products of infringement that do not use the invention as claimed. Given the importance of these three claim terms to the case, Defendants intend to focus their Markman argument on them.

**A. “Entire Clock” Limitations**

<b>Claim Term</b>	<b>Defendants' Proposed Construction</b>	<b>Plaintiffs' Proposed Construction</b>
an entire [ring oscillator variable speed system clock] in said single integrated circuit (cls. 1, 2);	a [ring oscillator variable speed system clock] that is completely on-chip and does not rely on a control signal or an external crystal/clock generator	a [ring oscillator] that generates the signal(s) used for timing the operation of the CPU, capable of operating at speeds that can change, where the ring oscillator is located entirely on the same semiconductor substrate as the CPU
an entire [ring oscillator system clock] constructed of electronic devices within the integrated circuit (cls. 3, 4, 5);	a [ring oscillator system clock] that is completely on-chip and does not rely on a control signal or an external crystal/clock generator	a [ring oscillator] that generates the signal(s) used for timing the operation of the CPU, where the ring oscillator is located entirely on the same semiconductor substrate as the microprocessor
an entire [oscillator] disposed upon said integrated circuit substrate (cls. 6, 7, 8, 9);	an [oscillator] that is completely on-chip and does not rely on a control signal or an external crystal/clock generator	an [oscillator] that generates the signal(s) used for timing the operation of the CPU, where the oscillator is located entirely on the same semiconductor substrate as the CPU and is electrically coupled to the CPU
an entire [variable speed clock] disposed upon said integrated circuit (cl. 10).	a [variable speed clock] that is completely on-chip and does not rely on a control signal or an external crystal/clock generator	a circuit that generates the signal(s) used for timing the operation of the CPU, capable of operating at speeds that can change, where the circuit is located entirely on the same semiconductor substrate as the CPU

The dispute between the parties regarding the “entire clock” limitations centers on whether a chip that has a clock that relies on an external crystal (or other external clock generator) or a control signal is an “entire” clock in a single integrated circuit. Despite the inventors’ repeated and emphatic statements to the Patent Office that their claimed invention

differed from microprocessors that relied on external crystals or control signals, Plaintiffs now take the opposite position in this litigation.

As Figure 17 from the patent makes clear, the 336 patent invention includes an entire “ring oscillator variable speed clock” on the chip that clocks the CPU, and a second fixed-frequency, crystal clock that clocks the I/O interface. Since the ring oscillator variable speed clock is entirely on the chip, its frequency can vary together with the processing frequency of the CPU, as operating parameters such as temperature, voltage and process variations change.

Here, through construction, however, the Plaintiffs are now attempting to claim what the inventors did not invent – a microprocessor that relies on external signals and circuitry to clock the CPU. Specifically, the Plaintiffs seek to cover a chip where its CPU relies on a fixed-frequency, external crystal. But when a chip is clocked that way, the speed of the CPU does not vary together with the processing frequency of the CPU because its speed is dictated by a fixed frequency crystal clock off-chip. Such a fixed clocking scheme is not encompassed by the 336 patent and was specifically surrendered by the inventors to get their claims allowed.

#### **1. The Inventors Expressly Disclaimed Any Reliance On An External Crystal/Clock Generator Or Control Signal**

As discussed above, the inventors expressly disclaimed microprocessors that have clock circuits that rely on external crystals/clock generators or controls on their speed. Indeed, they specifically amended their claims to add the term “entire” to distinguish over the Magar patent, which disclosed a microprocessor with an on-chip clock generator that relied on an external crystal:

In response, the independent claims have been rewritten to specify that the entire ring oscillator variable speed system clock, variable speed clock or oscillator be provided in the integrated circuit, in order to sharpen the distinction over the [Magar] prior art. Because the prior art does not provide an entire ring oscillator variable speed system clock, . . . , **in that the prior art circuits require an external crystal**, the prior art fails to teach or suggest the invention as now claimed.

Ex. L at 3 [2/6/98 Amendment] (emphasis added).<sup>7</sup>

The inventors repeatedly explained that the claimed microprocessor differed from conventional microprocessors such as the Magar microprocessor, because unlike those prior art chips, it did not rely on an off-chip crystal for its system clock:

- “Thus while most of Magar’s clock (generator) circuitry is on the IC, the entire oscillator, which because it requires an external crystal, is not.” Id. at 4.
- “Magar’s clock generator relies on an external crystal connected to terminal X1 and X2 to oscillate, as is conventional in microprocessor designs. It is not an entire oscillator in itself.” Id. at 3.
- “This is simply because the Magar microprocessor clock is frequency controlled by a crystal which is also external to the microprocessor. . . . The Magar microprocessor in no way contemplates a variable speed clock as claimed.” Ex. J at 3-4 [7/7/97 Amendment].
- “A review of the Magar reference shows that it is apparently no more pertinent than prior art acknowledged in the application, in that the clock disclosed in the Magar reference is in fact driven by a fixed frequency crystal, which is external to the Magar integrated circuit.” Id. at 2.
- “The essential difference is that the frequency or rate of the [clock] signals is determined by the processing and/or operating parameters of the integrated circuit containing the Fig. 18 circuit, while the frequency or rate of the [clock] signals depicted in Magar Fig. 2a are determined by the fixed frequency of the external crystal connected to the circuit portion outputting the [clock] signals shown in Magar Fig. 2a.” Ex. L at 2 [2/6/98 Amendment].

In addition to Magar, the inventors distinguished other prior art references that contained various iterations of “conventional crystal clocks,” specifically including prior art chips in which an off-chip crystal is used as a reference signal for the on-chip clock circuitry:

Conventionally, a CPU is driven by a clock that is generated by a crystal. **The crystal might be connected directly to two pins on the CPU, as in Magar, and be caused to oscillate by circuitry contained in the CPU with the aid or possibly other external components.** Alternatively, the crystal may be contained in a package with the oscillation

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<sup>7</sup> This statement alone demonstrates the illusory nature of Plaintiffs’ argument that the inventors’ statements concerning Magar were just describing the teachings of a single reference rather than defining the scope of their invention. Pl. Br. at 20. The inventors’ addition of “entire” and repeated arguments that Magar did not show an entire oscillator on chip plainly demonstrate that they indeed were defining the scope of their invention.

circuitry, the packaged component thus called an oscillator, and connected to one pin on the CPU as in Edwards et al., U.S. Patent 4,680,698. . . . Other cited reference have similar examples, see Palmer, U.S. Patent 4,338,675, Fig. 1, item 24; Pohlman et al. U.S. Patent 4,112,490, Fig. 1, item 22. **All these systems operate at a frequency determined by the external crystal.**

Ex. J at 4 [7/7/97 Amendment]. (emphasis added).

The inventors further distinguished the claims over Sheets by arguing that Sheets used an external clock generator, such as an external voltage controlled oscillator:

The system of Sheets effects microprocessor clocking in a way which is entirely dissimilar from that of the present invention, and in fact teaches away from Applicants' clocking scheme. In particular, Sheets describes the use of discrete, commercially available microprocessor chips, e.g., the Motorola 68000 (col. 5, line 16), driven by a separate clock (VCO of FIG. 1).

Ex. E at 8 [4/11/96 Amendment].

Additionally, the inventors disclaimed any reliance on a control input to adjust or stabilize the clock's frequency.<sup>8</sup> For example, in response to the Patent Office's rejections, the inventors explained that conventional oscillators had "many mechanisms that can be used to control the output of a variable-frequency oscillator, including manual inputs, program-controlled inputs, temperature sensors, or other devices." Ex. J at 5 [7/7/97 Amendment]. Unlike these clocks, the claimed clock requires that "the oscillation or clock frequency and the frequency of the driven device will automatically vary together." *Id.* They further explained to the Patent Office that "[t]his differs from all cited references in that . . . the oscillator or variable speed clock varies in frequency, but does not require manual or programmed inputs . . . to do so." *Id.* The inventors went even further and disclaimed the use of controlled oscillators altogether, whether the control is on-chip or not: "Even if the Examiner is correct that the variable clock in Sheets is in the same integrated circuit as the microprocessor of system 100, that still does not give the claimed subject matter. In Sheets, a command input is required to

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<sup>8</sup> It appears that Plaintiffs do not dispute this no-control-input limitation in their Opening Brief. Instead, they assert that this issue has more to do with the variable speed limitation, rather than the entire clock limitation. *See* Pl. Br. at 16.

change the clock speed.” Ex. G at 4 [1/13/97 Amendment]. The inventors stated flat out that simply having a CPU clock on the chip was not enough to meet the claimed invention. Controlling the on-chip ring oscillator’s speed using a command signal “does not give the claimed subject matter.” Id.

Given these clear amendments and statements in the file history, Plaintiffs are forced to admit that the inventors disclaimed something in seeking to overcome the prior art. See Pl. Br. at 18. However, they (and their expert) now try to say that what the inventors said to the Patent Office, and what they really meant, were two different things. Plaintiffs’ expert invokes technical distinctions, such as “voltage control oscillators,” “current controlled oscillators,” “delayed-locked loops,”<sup>9</sup> and “external clock generators” to try and parse and narrow the scope of the inventors’ disclaimers. But none of these distinctions were drawn by the inventors during prosecution. The inventors clearly and unambiguously disclaimed any use of external signals or structures as part of the CPU clock. Plaintiffs’ expert is, in effect, arguing that disclaimers should be limited to the art under examination – a proposition the Federal Circuit has repeatedly rejected. See Atofina v. Great Lakes Corp., 441 F.3d 991, 998 (Fed. Cir. 2006); Norian Corp. v. Stryker Corp., 432 F.3d 1356, 1361 (Fed. Cir. 2005) (“[T]here is no principle of patent law that the scope of surrender of subject matter made during prosecution is limited to what is absolutely necessary to avoid a prior art reference that was the basis for an examiner’s rejection.”).

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<sup>9</sup> Plaintiffs’ attempt to make this distinction is inconsistent with its disclaimer of the clocking system disclosed by the Edwards patent. Ex. J at 4 [7/7/97 Amendment]. Edwards teaches the use of an external clock input pin in connection with the clocking of the CPU of the Transputer microprocessor. See Ex. N at 4:54-5:6, Fig. 1 [U.S. Patent No. 4,680,698] (Edwards et al.) The Transputer microprocessor’s external clock pin is used to provide a clocking signal for an on-chip PLL, precisely the sort of combination of on-chip clock circuitry and external clock source that TPL is now attempting to argue is within the scope of its invention despite its clear disclaimer of clock circuits that rely on external clock sources. See Ex. Z at abstract, Fig. 1 [U.S. Patent No. 4,689,581 (Talbot)].

## 2. Plaintiffs Read “Entire” And Other Limitations Out Of The Claims

Defendants’ proposed construction of these claim limitations is not only consistent with the claim language and file history, but also in accord with the plain meaning of “entire,” which means that all of the parts must be included, not just some. See, e.g., Ex. M at 457 [THE AMERICAN HERITAGE DICTIONARY 457 (1985)] (defining “entire” as “Having no part excluded or left out; whole.”). Plaintiffs’ construction, which requires only that some of the clocking circuitry be on the chip, improperly reads the word “entire” out of the claims, a claim limitation the Patent Office required the applicants to add in order to allow the claims. Aero Prods. Int’l, Inc. v. Intex Recreation Corp., 466 F.3d 1000, 1013 (Fed. Cir. 2006) (“We also think the district court was correct when it stated that interpreting the claimed seal as being a seal that does not allow any air to leak through would render the term ‘substantially’ illusory.”).

Additionally, claim 1 does not simply require there to be a “ring oscillator” completely on chip. It requires a “ring oscillator variable speed system clock” to be completely on the chip. Plaintiff’s proposed construction states only that the “ring oscillator” is completely on chip, which is inconsistent with the plain claim language.

Finally, Plaintiffs’ proposed construction also ignores the additional limitation in claim 1, which requires “said central processing unit and said ring oscillator variable speed system clock . . . [to be] constructed of the same process technology with manufacturing variations.” The ring oscillator variable speed system clock cannot be constructed with the same process technology with corresponding manufacturing variations as the CPU if it requires a crystal that is manufactured separately. The claims themselves, including the context in which a term is used in a claim, “provide substantial guidance as to the meaning of particular claim terms.” Phillips v. AWH Corp., 415 F.3d 1303, 1314 (Fed. Cir. 2005).

## 3. Plaintiffs’ Construction Is Inconsistent With The Invention’s Purpose

Defendants’ proposed construction is the only one that makes sense in view of the purpose of the invention as set forth in the specification. As explained above, the 336 patent addresses the problem that conventional microprocessors are clocked at a fixed frequency in

order to account for the worst case scenario. The 336 patent proposed the solution of using an entirely on-chip clock that will, by virtue of being on-chip, vary together with the processing frequency of the CPU. As a result, when the CPU can safely run faster – because, for example, the temperature decreases – the on-chip clock will vary together and will run faster. The Plaintiffs’ proposed construction – which would encompass clocks that are locked to fixed-frequency crystals and other external clock generators – is inconsistent with the invention set forth by the specification because such clocks would not vary with changing conditions. See Alloc, Inc. v. Int’l Trade Comm’n, 342 F.3d 1361, 1370 (Fed. Cir. 2003) (“In this respect, this court looks to whether the . . . very character of the invention requires the limitation.”).

The point of the inventors’ prosecution arguments is clear: the invention is that the microprocessor operates at its processing frequency, i.e., its fastest safe speed given its manufacturing process or changes in its operating temperature or voltage. Ex. E at 8-9 [4/11/96 Amendment]. The processing frequency of the CPU must be matched by the system clock responding in the same way to the same conditions as the CPU. This precludes controlling the frequency of the clock, because this would inhibit the clock speed from changing in the same way as the CPU processing frequency changes.

#### **4. Negative Limitations Are Acceptable In Claim Construction**

In their last ditch effort, Plaintiffs and their expert assert that “negatively-phrased definitions are unhelpful to one of ordinary skill in the art attempting to determine the (positive) scope of the claims.” Pl. Br. n. 9. But the purpose of claim construction is not to determine or express the positive scope of claims – instead, it is to resolve disputes that are typically framed by the prior art. The Federal Circuit has repeatedly applied constructions based on negative limitations. See, e.g., Inpro II Licensing, S.A.R.L. v. T-Mobile U.S.A., Inc., 450 F.3d 1350, 1357 (Fed. Cir. 2006) (“host interface” excludes serial connection); Atofina, 441 F.3d at 998 (“chromium catalyst” excludes “all catalysts containing non-chromium metal oxides”). Indeed, where constructions are informed by disclaimer, there is often no other way to phrase them.

Moreover, while Plaintiffs' expert criticizes negative language in Defendants' constructions, he is perfectly willing to accept negative language when it is proposed by Plaintiffs. For example, Plaintiffs have offered constructions of "second clock" and "external clock" that are phrased entirely in the negative language. Plaintiffs even cited the prosecution history to support these negative limitations. Pl. Br. at 26.

**B. "Processing Frequency" Limitations**

<b>Claim Term from 336</b>	<b>Defendants' Proposed Construction</b>	<b>Plaintiffs' Proposed Construction</b>
processing frequency capability (cls. 1 & 2)	fastest safe operating speed at which the CPU can operate	the range of speeds at which the CPU can operate
processing frequency (cls. 1-10)	fastest safe operating speed	the speed at which the CPU operates

When the claims of the 336 patent refer to "processing frequency" or "processing frequency capability" of the CPU, they are talking about the fastest safe speed at which the CPU can operate, not the speed that at which it happens to be operating at any given time.

The patent explains that traditional prior art microprocessors were set to run at least "a factor of two slower than their maximum theoretical performance." (336:16:48-53). Why? Because the designers did not know the conditions under which the microprocessor would be operating, and wanted to guarantee the microprocessor would not fail under any conditions. Thus, even where the *speed limit* or "maximum theoretical performance" of a chip was much higher, according to the specification, the prior art strategy took the slowest speed based on the expected variability in manufacturing and operation and set the "clock rated speed" accordingly. This is equivalent to finding the lowest posted speed limit anywhere on the road (for example, 25 MPH) and driving at that speed regardless of areas where the speed limit is much higher. By driving at a lower speed than the maximum allowable speed, the chip wasted processing power and thus was capable of doing less work. In the "Detailed Description of the Invention," the inventors presented a scheme to recapture this lost speed, by placing an entire ring oscillator system clock on-chip that varies in the same way as the speed limit of the CPU so that: (1) "CPU

70 **always execute[s] at the maximum frequency possible**, but never too fast.” (336:17:1-2 (emphasis added)); and (2) “The CPU 70 executes at the fastest speed possible using the adaptive ring counter clock 430.” (*Id.* at 17:19-21). The purported invention of the 336 patent can thus be likened to a way for always matching the posted speed limit of a highway to the speed of the car. Plaintiffs cannot ignore these clear specification statements that define and determine claim scope.<sup>10</sup>

### **1. Plaintiffs’ Position Is Inconsistent With The Claim Language**

Plaintiffs’ current position is that the “processing frequency” simply refers to the speed at which the CPU operates. But such a construction makes no sense because a microprocessor always runs at the speed at which it is clocked. Gafford Decl. ¶ 18. This means that Plaintiffs’ construction – “the speed at which the CPU operates” – might have just as well stated the “clock rate.” The claims recite “clock rate,” however, separately from the “processing frequency.” For example, claim 6 requires “enabling said processing frequency to track said clock rate in response to said parameter variation.” By equating “clock rate” and “processing frequency,” Plaintiffs’ construction would effectively read “thereby enabling said clock rate to track said clock rate.” Stated another way, instead of enabling the speed of the car [the clock rate] to track the posted speed limit [the processing frequency], Plaintiffs’ approach means that the claim requires “enabling the speed of the car to match the speed of the car.” Their approach renders the claim language meaningless. See Innova/Pure Water, Inc. v. Safari Water Filtration Sys.,

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<sup>10</sup> Claims must be adequately grounded in the specification and the meaning of claim terms must be discerned in the context of the disclosed invention and the field of art. Curtiss-Wright Flow Control Corp. v. Velan, Inc., 438 F.3d 1374, 1381 (Fed. Cir. 2006); Nystrom v. TREX Co., 424 F.3d 1136, 1145 (Fed. Cir. 2005) (stating that it is “improper to read [a claim] term to encompass a broader definition” than the “ordinary and customary meaning revealed by the context of the intrinsic record.”). Indeed, “when the scope of the invention is clearly stated in the specification, and is described as the advantage and distinction of the invention, it is not necessary to disavow explicitly a different scope.” On Demand Mach. Corp. v. Ingram Indus., 442 F.3d 1331, 1340 (Fed. Cir. 2006). “Claims cannot be of a broader scope than the invention set forth in the specification.” *Id.*

381 F.3d 1111, 1119 (Fed. Cir. 2004) (“While not an absolute rule, all claim terms are presumed to have meaning in a claim.”).

Plaintiffs’ interpretation similarly makes nonsense of arguments proffered during prosecution. For example, in explaining that even if the crystal of Magar were fabricated on-chip, Magar would not result in the invention, the inventors argued that the frequency of the crystal would not “vary due to variations in manufacturing, operating voltage and temperature in the same way as the frequency capability of the microprocessor on the same underlying substrate, as claimed.” Ex. J at 4 [7/7/97 Amendment]. If the claims only required that the microprocessor operate at the speed of the clock, this argument would be false because a microprocessor will always operate at the speed at which it is clocked.

Indeed, if the “processing frequency” is not the speed limit or “fastest speed possible” of the CPU, it is hard to imagine what it would be. The claims require that the “clock rate” and the “processing frequency” be something different. Microprocessors without clocks do not have speeds, because they are not operating. Gafford Decl. ¶ 18. In this case, it only makes sense to talk about a speed that depends on the design of the microprocessor itself and not on the clock.

Further, Plaintiffs’ “processing frequency capability” construction does not make sense in the context of Claim 1: “a [range of speeds at which the CPU can operate] of said central processing unit and a speed of said ring oscillator variable speed system clock varying together.” How can a range vary together with a speed?

## **2. The Intrinsic Evidence Supports Defendants’ Construction**

During prosecution, and in the specification of the 336 patent, the inventors made it crystal clear that “processing frequency,” refers to the speed limit of the CPU. In their April 11, 1996, amendment, the inventors introduced the term “processing frequency” to the claims in order to distinguish over the Sheets reference:

Specifically, claims 19 and 65 now explicitly recite that the ring oscillator and microprocessor are provided within the same integrated circuit. Moreover, these claims further state that the plurality of transistors included within the ring oscillator clock have operating characteristics which vary similarly to operating

characteristics of transistors included within the microprocessor, **thereby enabling the processing frequency of the microprocessor to track the speed of the ring oscillator clock: ‘...CPU clock 70 executes at the fastest speed possible using the adaptive ring counter clock 430.** Speed may vary by a factor of four depending upon temperature, voltage and process.

See Ex. E at 8-9 (emphasis added). It would make no sense to talk about special measures being put in place to ensure that the system clock speed would track the “processing frequency” if “processing frequency” meant nothing more than the speed at which the microprocessor is being clocked.

Furthermore, the specification disclaims any microprocessor operating at less than its “fastest speed possible.” In the first paragraph describing the sole embodiment, the inventors distinguish over “traditional” prior art microprocessors that operate at a rated speed less than their “maximum theoretical performance.” (336:16:44-54). The inventors then describe the use of a ring oscillator as a system clock. Through use of this ring oscillator the “CPU 70 will **always** execute at the maximum frequency possible, but never too fast.” (Id. at 17:1-2) (emphasis added). This language allows for no embodiment where the CPU speed is operating at less than the maximum frequency possible. See SciMed Life Sys., Inc. v. Adv. Cardiovascular Sys., Inc., 242 F. 3d 1337, 1341 (Fed. Cir. 2001).

Despite their posturing, Plaintiffs never point to anything in the specification or prosecution that negates the clear statements that the CPU “always” runs at its maximum speed.<sup>11</sup> See Watts v. XL Sys., Inc., 232 F.3d 877, 883 (Fed. Cir. 2000). (“The specification

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<sup>11</sup> Plaintiffs attempt to avoid the statements made in the specification and prosecution history by arguing that the claims of the 336 patent recite a microprocessor that is “capable” of operating at its fastest operating speed, but do not require that the microprocessor must operate at its fastest safe operating speed in all instances. Even if Plaintiffs were correct that operation at the maximum speed is only a goal of the invention, the law is clear that a claim interpretation that aligns with the goal of the invention is likely to be correct. Hockerson-Halberstadt, Inc. v. Avia Group Intern., Inc., 222 F.3d 951, 956 (Fed. Cir. 2000); Renishaw PLC v. Marposs Societal per Azion, 158 F.3d at 1243, 1252 (Fed. Cir. 1998) (adopting a narrower interpretation of the term “when” because the broader interpretation was “so broad that it would require us to ignore the abounding statements in the written description that point decidedly the other way.”); AK Steel Corp v. Sollac, 344 F.3d. 1234; 1239-41 (Fed. Cir. 2003) (adopting a narrower interpretation of “consisting essentially of Aluminum” when the broader interpretation was not consistent with a “goal” of the invention).

does not explicitly discuss an embodiment [with the disclaimed feature] and, as discussed earlier, actually limits the invention to embodiments [without the feature]”). At times, Plaintiffs seem poised to argue that the “maximum speed” teachings in the patent represent only one embodiment among many. See, e.g., Pl. Br. at 22. But, when it suits Plaintiffs to contend that the specification limits claim scope, they rely on the single embodiment nature of the specification: “[t]hus, in the only embodiment, the second clock signal is not derived from the first clock signal.” Pl. Br. at 26.

Lastly, as discussed above, the inventors repeatedly argued to the examiner that the microprocessor encompassed by the claims “always executes at the maximum frequency possible, but never too fast.” See Ex. E at 6-9 [4/11/96 Amendment]; Ex. G at 3-4 [1/13/97 Amendment]. As supported by case precedent including that which the Plaintiffs cite, the inventors’ repeated statements to the Patent Office about the “invention,” and especially to differentiate over prior art, limit the scope of the claims. See Omega Eng’g, Inc. v. Raytek Corp., 334 F.3d 1314, 1326 (Fed. Cir. 2003) (patentee’s repeated statements during prosecution regarding the invention created an unmistakable surrender of subject matter); Day, Int’l, Inc. v. Reeves Bros., Inc., 260 F.3d 1343 (Fed. Cir. 2001) (repeated statements during the prosecution distinguishing over prior art deemed to limit claims); see also Modine Mfg. Co. v. U.S. Int’l Trade Comm’n, 75 F.3d 1545, 1551 (Fed. Cir. 1996) (holding that when a preferred embodiment is described as “the invention,” the claims are not entitled to a scope broader than the embodiment).

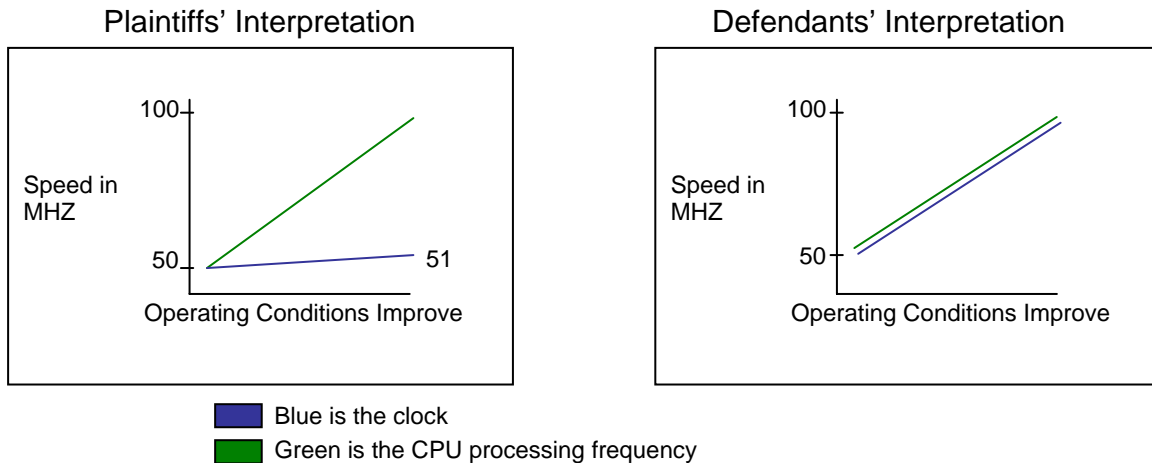
### C. "Varying Together" Limitations

Claim Term from 336	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
varying together (claims 1 & 2); varying . . . in the same way (claims 6-9); varying in the same way (claim 10)	increasing and decreasing by the same amount	both increase or decrease

Claim Term from 336	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
vary together (claims 3-5)	increase and decrease by the same amount	

The 336 patent describes and claims a system in which the speed of the clock dynamically adjusts along with the speed capability of the CPU. When the claims talk about the clock speed "varying together" with the processing frequency of the CPU, they mean that when one changes, the other changes proportionally as well. The invention is directed to running the CPU at the highest safe operating speed at all times, and the clock variability is what makes that happen. Plaintiffs' construction attempts to discard this key feature—the only one identified for the disclosed clock structure: "CPU 70 will always execute at the maximum frequency possible, but never too fast." (336:17:1-2). The only way that the invention can function properly is by matching the clock speed to the CPU's processing speed capability.

Based on American Heritage's definition of "together," and using Plaintiffs' analogy of a symphony, a CPU/clock are "together," just like a soloist and an orchestra are "together," if they are "in harmony or accord." See Ex. M at 1275 [THE AMERICAN HERITAGE DICTIONARY (1989)]. When combined with the definition of "vary" – i.e., "to change or alter" – the phrase "varying together" requires that the operating parameters cause the clock frequency and the CPU frequency to change in agreement or harmony. See id. at 1338. Defendants' construction that these parameters "increase[] or decrease[] in the same amount" is consistent with these dictionary definitions. In contrast, Plaintiffs' construction, which requires simply that they both go up or down is not. Under Plaintiffs' view, the patent could be read on a system where the CPU frequency capability went up 50 MHZ and the clock rate only went up 1 MHZ. But this could not possibly constitute "varying together" – the two are not in harmony (or, in other words, the soloist and orchestra are out of synch) – as the chart below plainly reveals:



Even more problematic under Plaintiffs' view, the patent could be read on a system where the CPU frequency went from 50 MHz to 100 MHz and the clock went from 25 MHz to 150 MHz. In this situation, however, the clock frequency exceeds the CPU processing frequency, and the CPU would be inoperable. Gafford Decl. ¶ 21.

The 336 specification also supports Defendants' construction. It describes that the speed of the clock dynamically adjusts along with the speed capability of the CPU, which may result in large speed changes. "The CPU 70 executes at the fastest speed possible using the adaptive ring counter clock 430. **Speed may vary as a factor of four depending upon temperature, voltage, and process.**" (336:17:19-22). Moreover, there are numerous statements in the file history that the processing frequency should "track" the clock rate:

- **"In accordance with the claimed invention**, the central processing unit and the ring oscillator variable speed system clock are provided in a single integrated circuit. This allows, for example, the central processing unit **to track** variations in the speed of the ring oscillator variable speed system clock, since the elements of each are disposed in the same integrated circuit." Ex. E at 6 [4/11/96 Amendment] (emphasis added).
- "Moreover, these claims further state that the plurality of transistors included within the ring oscillator clock have operating characteristics which vary similarly to operating characteristics of transistors included within the microprocessor, thereby enabling the processing frequency of the microprocessor **to track** the speed of the ring oscillator clock." *Id.* at 8 (emphasis added).

- Applicant agrees that the processing frequency capability of the CPU would track the clock rate capability of the clock generator, as this is controlled by the laws of physics on which the Pelgrom reference is based. However, **there would be no ‘tracking’ of the clock rate produced by the Magar** clock generator, because the entire circuit is not provided on the integrated circuit.” Ex. L at 3 [2/6/98 Amendment] (emphasis added).

The inventors further made clear that the clock rate and processing frequency (which is dependent on operating parameters) track each other by the same amount – that is “correspondingly” or “commensurately”:

- “Applicants are aware of no prior art teaching or suggesting a variable speed oscillator in the same integrated circuit with a microprocessor and clocking the microprocessor with a clock speed that **varies correspondingly** with changes in operating characteristics of electronic devices making up the microprocessor.” Ex. G at 4 [1/13/97 Amendment] (emphasis added)
- “[T]he microprocessor and clock will naturally tend to **vary commensurately in speed** as a function of various parameters (e.g., temperature) affecting circuit performance.” Ex. E at 8 [4/11/96 Amendment] (emphasis added).

Thus, contrary to Plaintiffs’ construction, simply both going up or down is not enough. That is not what the inventors told the Patent Office in order to obtain the patent. Instead, the speed of the clock must commensurately track the speed capability of the CPU.<sup>12</sup>

## V. OTHER DISPUTED TERMS OF THE 336 PATENT

### A. "variable speed" and "fixed frequency"

Claim Term from 336	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
variable speed (cls. 1-10)	having a speed that is not tightly controlled and varies more than minimally	capable of operating at speeds that can change
fixed-frequency (cls. 2, 4, 8)	having a speed that is tightly controlled and varies	Plaintiffs do not believe the Court should construe this

<sup>12</sup> Plaintiffs’ criticism of the “same amount” language proposed by Defendants is misplaced since Defendants have never insisted on precise mathematical precision – only, that the two parameters track each other commensurately, as the inventors told the Patent Office. If the Court is concerned that the language proposed by Defendants suggests exact mathematical precision, then perhaps a more appropriate definition would be “increasing or decreasing commensurately.”

Claim Term from 336	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
	minimally	term, but they propose:  a non-variable frequency

The principal issue in dispute here is whether the minimal variation inherent in a clock's output make it a variable-speed clock rather than a fixed-frequency clock. The reality is that no clock can ever have a 100% fixed frequency due to noise and other issues. In order to be a variable-speed clock within the meaning of the 336 patent, the speed of the clock must be capable of more variation than this minimal variation. The entire point of the invention was that the clock would be able to vary so as to track the processing frequency of the CPU as it changes based on operating parameters such as temperature. Construing "variable speed" to encompass the minimal variations inherent in fixed-frequency crystals would obliterate the whole point of the 336 patent. See Curtiss-Wright, 438 F.3d at 1378-79 (rejecting construction of "adjustable" as "capable of making a change to something or capable of being changed" because, "This court finds it difficult, if not impossible, to imagine any mechanical device that is not 'adjustable' under the ordinary meaning of that term adopted by the district court.").

The specification clearly distinguishes between variable-speed and fixed-speed clocks. (336:17:32-34) ("By decoupling the **variable speed** of the CPU 70 from the **fixed speed** of the I/O interface 432, optimum performance can be achieved by each.") (emphasis added). During prosecution, the applicants distinguished "variable speed clocks" from crystal-controlled clocks, based on the fact that crystals are "fixed frequency devices" whose frequencies "vary minimally":

Crystals are by design **fixed-frequency devices** whose oscillation speed is designed to be **tightly controlled and to vary minimally** due to variations in manufacturing, operating voltage and temperature. The Magar microprocessor in no way contemplates a variable speed clock as claimed.

Ex. J at 3-4 [7/7/97 Amendment] (emphasis added). The inventors argued consistently since prosecution of the parent U.S. Patent No. 5,440,749 application that “fixed” crystal oscillation is “near constant,” whereas the inventive “variable speed clock” must vary more than that:

If the CPU clock were the same as the direct memory access clock, CPU instructions would have to be slowed down to less than their fastest speed, because, while the **operation of a crystal is near constant** over voltage and temperature, the operation of transistors is not.

Ex. O at 5-6 [749 patent, 12/31/92 Office Action]; see also Ex. P at 16 [749 patent, 7/06/93 Amendment] (emphasis added).

Thus, the inventors made clear that fixed frequency can include minimal variation, whereas variable speed requires more. Contrary to Plaintiffs’ construction, any minimal amount of variation is not enough to constitute variable speed. Patentees cannot simply ignore the statements made during prosecution to get the patent granted.

#### **B. Clocking Circuitry Limitations**

<b>Claim Term from 336</b>	<b>Defendants' Proposed Construction</b>	<b>Plaintiffs' Proposed Construction</b>
system clock	a circuit that is itself responsible for determining the frequency of the signal(s) used for timing the operation of the CPU	a circuit that generates the signal(s) used for timing the operation of the CPU
oscillator . . . clocking	an oscillator that is itself determining the frequency of the signal(s) used for timing	Plaintiffs do not believe that the terms needs to be construed by the Court:  the oscillator generates the signal(s) used for timing the operation of the CPU

Plaintiffs’ construction allows any on-chip circuitry used between an external signal and the CPU to be called clocking circuitry—even though that circuitry is not itself sufficient to determine the frequency of the clocking signal. This construction reads the “entire” limitation out of the claims. As discussed above, the inventors made clear that the “entire” clock must be on the chip, and cannot rely on external crystals/clock generators or command inputs. For

example, in distinguishing Magar, the inventors made clear that, although the on-chip circuitry in Magar generated a signal, the frequency of that signal was determined by an off-chip crystal. Thus, the on-chip clock generator in Magar did not itself determine the clocking frequency. Rather Magar's combination of the off-chip crystal and the on-chip clock generator itself generated the clocking signals, and thus was the system clock. Because that system clock was not entirely on-chip, Plaintiffs argued that its claimed invention was different. The Court should reject Plaintiffs' attempt to undermine the "entire" limitations and expand the scope of the clocking circuitry language to encompass subject matter they distinguished and defined their purported invention over during prosecution.

### C. "microprocessor"

Claim Term from 336	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
microprocessor	an electronic circuit that uses a central processing unit to interpret and execute programmed instructions	an electronic circuit that executes programmed instructions and is capable of interfacing with input/output circuitry and/or memory circuitry

The dispute here is whether electronic circuits that do not contain central processing units are "microprocessors." They are not. What makes an electronic circuit a microprocessor is the inclusion of a central processing unit that can execute instructions. This is reflected in standard dictionary definitions:

- "microprocessor: A microprocessor is an integrated circuit **containing the entire CPU of a computer**, all on one chip, so that only the memory and input-output devices need to be added. . . ." Ex. Q at 196 [DICTIONARY OF COMPUTER TERMS (1989)].
- "microprocessor: **A small digital computer consisting essentially of a central processing unit** with a limited amount of storage and some interface connectors. Microprocessors are now extensively used wherever mathematical and/or logic operations are required to be carried out in sequence and/or under the control of one or more input signals, e.g. in controlling automatic washing machines or machine tools. It is now possible to include all the components necessary in a microprocessor in a single monolithic integrated circuit." Ex. R at 187 [DICTIONARY OF ELECTRONICS (1987)].

- “Microprocessor (\*Integrated Circuit) An integrated circuit (IC) that provides, in one ‘chip,’ the processing functions of a **central processing unit**. A microprocessor receives input, interprets and executes instructions, handles arithmetical and logic operations, and generally has at least some memory capability. . . . Synonymous with Computer-on-a-Chip.” Ex. S at 280 [THE PRENTICE-HALL STANDARD GLOSSARY OF COMPUTER TERMINOLOGY (1985)].

Additionally, not all microprocessors necessarily have to be capable of interfacing with input/output circuitry and memory circuitry. While a microprocessor must have some ability to communicate with the outside world to be useful, it does not necessarily have to have an input/output interface. For example, it may communicate only by writing to and reading from external memory. Similarly, a microprocessor does not necessarily need to have the ability to connect to an external memory. Some microprocessors rely solely on on-chip memory.

#### D. “central processing unit”

Claim Term from 336	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
central processing unit	the central electronic circuit in a computer that controls the interpretation and execution of programmed instructions	an electronic circuit that controls the interpretation and execution of programmed instructions

As explained above in connection with the term “microprocessor,” a central processing unit is the main portion of a microprocessor that controls the interpretation and execution of programmed instructions. The dispute here is whether a CPU is any circuit that interprets and executes instructions, or rather whether it is a circuit in a computer that does so. Persons of ordinary skill in the art would recognize that the term “central processing unit” refers to a part of a computer. See, e.g., Ex. T at 318 [MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (4th ed. 1989)] (“central processing unit: **The part of a computer** containing the circuits required to interpret and execute the instructions.”) (emphasis added).

Plaintiffs’ main argument is based on a mischaracterization of Defendants’ construction to suggest that it requires that the CPU be in a computer. Defendants simply meant that a CPU must be part of a computer chip (i.e, a microprocessor) which *of course* may, in turn be located in a camcorder or automobile, in addition to personal computers. Although Defendants believe

their construction is clear, if the Court thinks that this might confuse the jury, Defendants respectfully suggest that it might change the term “computer” to “computer or microcomputer,” for example, rather than dropping the description altogether.

**E. “oscillator”**

Claim Term from 336	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
oscillator	a circuit that is capable of maintaining an alternating output	a circuit that is capable of maintaining an alternating output using feedback

An “oscillator” is a circuit that is capable of maintaining an alternating output. Any circuit that has this capability is an oscillator. See, e.g., id. at 1339-40 (“oscillator: An electronic circuit that converts energy from a direct-current source to a periodically varying electric output.”). Plaintiffs propose that the Court carve out of the definition of “oscillator” any circuits that do not “use feedback.” While it is not clear precisely what Plaintiffs mean by the phrase “using feedback,” there is no basis to include it in the definition of “oscillator.” Any circuit that is capable of maintaining an alternating output—whether or not it uses feedback—is an oscillator.

**F. “ring oscillator”**

Claim Term from 336	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
ring [oscillator] (cls. 1-5)	an [oscillator] having an odd number of inverting logic stages connected in a loop	an oscillator having a multiple, odd number of inversions arranged in a loop

The dispute on this term is whether a “ring oscillator” must have a “multiple, odd number” of inverters of (i.e., at least three), as Plaintiffs contend, or whether it could have just one, as Defendants contend. Plaintiffs’ assertion that a “ring oscillator” must have three or more inverters is found nowhere in the 336 claims, the 336 specification nor the file history. It is flatly contradicted by, for example, one of the leading textbooks on semiconductor design, which clearly shows that a ring oscillator can be built with a single inverter:

the figure allow for *taps* at various points along the delay.

Clocks that employ these delays as timers are all elaborations of the *ring oscillator* circuit shown in Fig. 7.9(a). Rings of an odd number of inversions have no stable condition and will oscillate with a period that is some odd submultiple of the delay time twice around the ring. The oscillation of the largest period may eventually predominate following bringing power on, but the erratic clock signals produced during power-up could leave the system in a peculiar state. It is much better to produce an initialization signal that is held high during power-up and to use it to initialize the state *and the clock*. In the modification of the ring oscillator shown in Fig. 7.9(b), clock signals are suppressed during initialization and will start im-

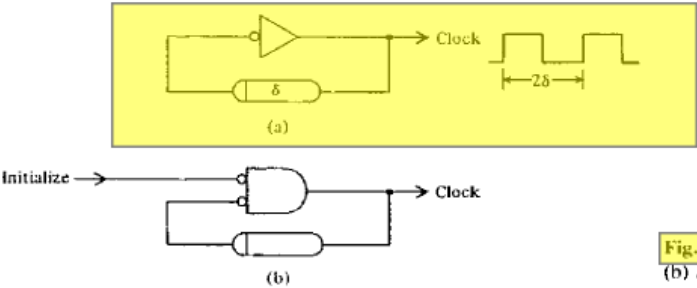


Fig. 7.9 (a) Ring oscillator.  
(b) Symmetrical clock.  
(c) Universal clock.

Ex. U at 235 [MEAD & CONWAY, INTRODUCTION TO VLSI SYSTEMS (1980)] [MEI-ED00012335].

Plaintiffs argue that a “ring oscillator” must contain three or more inverters based on examples set forth in a text and articles on CMOS circuits, all of which postdate the patent priority date. But these references far from *define* the term or conflict with Defendants’ construction—they simply offer other, more elaborate examples of ring oscillators.

G. “second clock independent of said [ring oscillator variable speed system clock]”

Claim Term from 336	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
second clock independent of said [ring oscillator variable speed system clock] (cls. 1-2);	a [second clock] wherein a change in the frequency of one of the second clock or the ring oscillator system clock does not affect the frequency of the other	a change in the frequency of the ring oscillator does not affect the frequency of the second clock
second clock independent of the [ring oscillator variable speed system clock] (cls. 3-5);		
external clock is operative at a frequency independent of a clock frequency of said [oscillator] (cls. 6-9);	an [external clock] wherein a change in the frequency of one of the external clock or oscillator does not affect the frequency of the other [claim	a clock not derived from the first clock, and which is not originated on the same semiconductor substrate upon which the entire oscillator

Claim Term from 336	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
independent of said [oscillator] (cl. 10)	6]	[claims 6-9] or the entire variable speed system clock [claim 10] is located

The dispute here centers on whether the term “independent” in the context of the 336 patent claims requires “one-way independence” of the second clock or requires “two-way independence” of both the first and second clocks. With respect to claims 1-5, Plaintiffs attempt to convince the Court that the patent claims should be limited such that the term “independent” has the narrow meaning that “a change in frequency” of the first clock “does not affect the frequency of the second clock.” With respect to claims 6-10, they attempt to narrow the term even further, suggesting that “independent” is limited to “not derived from . . . and which is not originated on the same semiconductor substrate.” But this unduly limits the claim language and lacks support in the intrinsic record.

The patent specification supports the Defendants’ concept of “two-way independence” between the variable-speed and I/O clocks. The central concept of the purported invention requires a “dual-clock scheme” in which the first clock is independent of the second clock.

Most microprocessors derive all system timing from a single clock. . . . The microprocessor 50 provides a *dual-clock scheme* as shown in FIG. 17, with the CPU operating *asynchronously* to the I/O interface 432 forming a part of memory controller 118 (FIG. 2) and the I/O interface 432 operating synchronously with the external world of memory and I/O devices.

*Id.* at 17:12-19 (emphasis added).

As Plaintiffs and their expert repeatedly state, the specification sets forth “a single embodiment”—and that embodiment is one in which the I/O clock is a “fixed,” “conventional crystal clock,” so the first clock *must* be independent of that in order to maintain a “variable speed.” 336 patent at 17:25-34. Both the first and second clocks are described as functioning independently from the other throughout the patent specification. For example, in addition to the citations above:

- “The CPU [] operates at a variable processing frequency dependent upon a variable speed of the ring oscillator variable speed system clock.” *Id.* at abstract.

- “The input/output interface is independently clocked by a second clock connected thereto.” *Id.*
- “The ring oscillator frequency is determined by the parameters of temperature, voltage, and process.” *Id.* at 16:59-60.

The Plaintiffs’ construction conflicts with the purpose of the invention, which requires that the first clock function independently from the second clock. Gafford Decl. at ¶ 28.

## **VI. BACKGROUND OF THE 148 PATENT**

The 336 and 148 patents<sup>13</sup> share the same specification. There also is no dispute that the file history for the 336 patent is directly relevant to the construction of the 148 patent.<sup>14</sup>

The 148 patent claims were originally directed to a microprocessor with large amounts of on-chip memory. The Patent Office rejected all of the initial claims of the 148 patent in view of the prior art Edwards and Bell patents based on the obviousness of the memory limitation. See Ex. W at 3 [1/31/00 Office Action]. The examiner stated that, “[w]hether or not memory occupies more substrate area than the processor is dependent on whether more memory is desired. No inventive concept is seen by allowing the memory to use more substrate area than the processor.” *Id.*

In response to the rejection of its initial claims, the inventors did not argue that the memory limitations were inventive. Instead, acquiescing in the Patent Office’s rulings, the inventors amended their claimed invention to include the on-chip clock concept that was the subject of the 336 Patent. In support of this amendment, the inventor specifically pointed to the portion of the patent specification common to both the 148 and 336 patents discussing the on-chip clock. See Ex.X at 6 [5/3/02 Amendment] (citing 7/29/98 Orig. App. at 24-56:31 to 25-56:11). Additionally, the inventors again explained that their claimed invention was different

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<sup>13</sup> U.S. Patent No. 6,598,148 (“148 patent”), attached hereto as Exh. V.

<sup>14</sup> See Plaintiffs’ Op. Br. at 34 (citing *NTP, Inc. v. Research In Motion, Ltd.*, 418 F.3d 1282, 1293 (Fed. Cir. 2005)).

from the prior art Edwards patent because the microprocessor in Edwards relies on an external crystal for the system clock. See id.

## VII. DISPUTED TERMS OF THE 148 PATENT

### A. “a memory”

Claim Term from 148	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
a memory (cls. 4, 7, 8, 10)	<i>If term is definite:</i>  an information storing array that does not include registers, cache or column latches	Plaintiffs believe "memory" should be construed without "a":  all of the storage elements on the substrate and the control circuitry configured to access the storage elements

The claims of the 148 patent make clear that registers, cache and column latches are distinct from “a memory” disclosed in the 148 patent. For example, claim 1 distinguishes between “a memory” and the “column latches” coupled to the memory:

a **memory** coupled to said processing unit and capable of storing information provided by said processing unit;  
a plurality of **column latches** coupled to the processing unit and the **memory**, wherein, during a read operation, a row of bits are read from the memory and **stored in the column latch**

(148 patent at claim 1). The fact that column latches can store information does not make them “a memory” within the meaning of the claims since the claim itself shows that both can store information. If memory were construed to extend to all column latches, registers and caches, as Plaintiffs suggest, regardless of their location or function, claim 1 would require “[*memory*] coupled to the processing unit *and the memory*.” Overlooking the unlikelihood that the inventor intended to use two separate terms in the same clause to describe the same thing, the use of the articles “a” and “the” clarifies that only one memory exists in this context. Gafford Decl. ¶ 29.

The language of the 148 patent does not support Plaintiffs’ construction of “a memory” as including every isolated and miniscule instance of latch or register on the substrate, many of which could be wholly unrelated to a storage array. Rather, it speaks broadly of “integrat[ing] a

CPU directly onto . . . memory chips.” (148:6:49-50). Moreover, the specification recognizes the presence of latches, registers and cache within CPUs 70 and 72, which are consistently considered separate from memory in the intrinsic record. (See *id.* at 4:5-10; 4:14-19; 5:58-60; 9:6-28; 12:42-45; Figs. 2, 21). Even Plaintiffs acknowledge in their brief that at least the instruction register “is a special register **of the control unit**,” which does not comprise “a memory.” Pl. Br. at 38 (emphasis added). Thus while storage arrays may include components such as registers, when the components are unrelated to a storage array, the 148 specification acknowledges their association with a separate circuit device (such as a CPU) and their distinctness from memory. For instance, the lone arguable support for the “majority” limitation (Fig. 9 and the discussion at 6:67-7:12) discusses only the integration of DRAM array 311 and the CPU. The instruction register in the figure is not numbered or mentioned at all.

Plaintiffs’ argument rests on a misinterpretation of Defendants’ proposed construction and is therefore inapposite to the dispute regarding the construction of “a memory.” Plaintiffs state that DRAM, comprising a storage array, can include a column latch, which is treated as a cache in the patent disclosure. Defendants fully agree that registers, cache and column latches are considered part of memory *when they are included in the storage array*. Defendants’ construction is only intended to exclude from “memory” the various registers, cache and column latches that are not incorporated into the storage array. This definition reflects exactly how the term “memory” would be understood by someone having ordinary skill in the art. Gafford Decl. ¶29.

**B. “total area of said single substrate”**

<b>Claim Term from 148</b>	<b>Defendants' Proposed Construction</b>	<b>Plaintiffs' Proposed Construction</b>
total area of said single substrate (claims 4 & 7);  total area of said substrate (claims 8 & 10)	area enclosed by the outermost edges of the substrate	the total surface of the supporting material upon or within which is formed an interconnected array of circuit elements

The parties' dispute over these terms is whether or not the word "total" should be defined as the "area enclosed by the outermost edges" of the substrate. All of the claims of the 148 patent require the memory to occupy "a majority" of the "total area" of the substrate. Defendants' construction of "total" conveys the plain meaning of the term in the context of a semiconductor substrate and will provide guidance to the jury in the event that they need to examine measurements of the accused products' substrates and memories.

Defendants' construction is in no way a bald land grab, as Plaintiffs suggest. It does not imply that the jury must measure all six sides of the substrate to determine what would be "a majority" of that area, for purposes of infringement. It simply means the "area enclosed by the outermost edges" of the face of the substrate upon which the integrated circuit is formed.

**C. "the [ring oscillator] disposed on said integrated circuit substrate"**

<b>Claim Term from 148</b>	<b>Defendants' Proposed Construction</b>	<b>Plaintiffs' Proposed Construction</b>
the [ring oscillator] disposed on said integrated circuit substrate (claims 4 & 7);  the [ring oscillator] disposed on said substrate (claims 8 & 10)	the [ring oscillator] is on-chip and does not rely on a control signal or an external crystal/clock generator	Plaintiffs do not believe that the terms needs to be construed by the Court:  a circuit having a multiple, odd number of inversions arranged in a loop, where the circuted is located on the integrated circuit (single) substrate

The dispute here centers on whether the on-chip ring oscillator may rely on an external crystal, or other external clock source. As they did with the 336 patent, Plaintiffs argue that the 148 patent also covers devices that rely on off-chip clock sources even though the inventor disclaimed such devices during prosecution. See supra Sections III & IV.A. Specifically, the applicants consistently maintained the distinction between his invention and chips that were clocked by external signals:

The Applicant has amended Claims 1, 4 and 8 to include the feature that a variable speed system clock is further disposed on the substrate. . . . Edwards does not disclose the feature of a system clock on the same substrate as the processing unit. Edwards discloses

in Figure 1 the structure of the microprocessor. The figure, as well as accompanying description on Column 4 line 54 through Column 5 line 6, describe the clock as an **external signal provided to the processor**.

Ex.\_\_\_ at 6 [05/03/02 Amendment].

**D. “a [ring oscillator] having a variable output frequency”**

<b>Claim Term from 148</b>	<b>Defendants' Proposed Construction</b>	<b>Plaintiffs' Proposed Construction</b>
a [ring oscillator] having a variable output frequency (cls. 4, 7, 8, 10)	a [ring oscillator] having an output speed that is not tightly controlled and varies more than minimally	Plaintiffs do not believe that this term needs to be construed by the Court:  a circuit having a multiple, odd number of inversions arranged in a loop that generates an output having a frequency that can change

As with the 336 patent, the parties disagree as to whether “variable speed” means simply “can change,” or that the frequency is not tightly controlled and must be able to change more than minimally. The inventor added this claim limitation to overcome an obviousness rejection based on Edwards and pointed to the same variable speed ring oscillator (430) as in the 336 patent. Thus, for the reasons discussed above, variable speed requires more than the minimal variation inherent in fixed frequency device. And, for the reasons discussed above, there is no basis for requiring that a ring oscillator have a multiple number of odd inverters.

**E. "integrated circuit substrate"**

<b>Claim Term from 148</b>	<b>Defendants' Proposed Construction</b>	<b>Plaintiffs' Proposed Construction</b>
integrated circuit substrate (cls. 4, 7, 8, 10)	a single supporting material upon or within which is formed a miniature circuit	Plaintiffs do not believe that this term needs to be construed by the Court:  the supporting material upon or within which is formed an interconnected array of circuit elements

The parties have already agreed that “integrated circuit” should be construed as “a miniature circuit on a single semiconductor substrate.” See Joint Claim Construction & Pre-Hearing Stmt. at Ex. A. For some reason Plaintiffs are departing from this agreed definition in their proposed construction of “integrated circuit substrate,” referring to the “integrated circuit” as “an interconnected array of circuit elements” and refusing to agree that a substrate is “a single supporting material.” Defendants’ proposed construction of “integrated circuit substrate” is consistent with both the parties’ agreed definition of “integrated circuit” and relevant dictionary definitions. See, e.g., Ex. Y at 613 [COMPUTERS, INFORMATION PROCESSING & TELECOMMUNICATIONS (2d ed. 1987)] (“In a microcircuit, **the supporting material upon which or within which an integrated circuit is fabricated**, or to which an integrated circuit is attached, synonymous for *base*.”) (emphasis added).

**F. “interface ports for interprocessor communication”**

Claim Term from 148	Defendants' Proposed Construction	Plaintiffs' Proposed Construction
interface ports for interprocessor communication (cls. 8, 10)	channels through which data is transferred between two separate processing units	Plaintiffs do not believe that this term needs to be construed by the Court:  channels through which data can be transferred between two separate processing units

The parties disagree as to whether this term should be construed to mean that data “can be transferred” or that data “is transferred” between separate processing units. Consistent with their incorrect view that claim terms should be treated as suggestions rather than actual limitations, Plaintiffs argue that their proposed construction requires only that the interface ports be “capable” of being used for interprocessor communication. Plaintiff’s construction should be rejected. If they were to prevail, the interface ports could be used for any purpose and the words “for interprocessor communication” would be given no meaning and rendered superfluous. Moreover, the claim language itself indicates that the microprocessor as claimed has different interfaces for different purposes. Claim 8 includes “interface ports for interprocessor

communication” and “a memory coupled to said processing unit.” In addition, Claim 11 includes a first memory coupled to a first processing unit and a second processing unit coupled to a first processing unit and “configured for interprocessor communication with said first processing unit.” Claim 11. These claims speak separately of the processing units being coupled to memory on the one hand and processing units coupled to one another via interface ports for interprocessor communication.

### **VIII. CONCLUSION**

For the foregoing reasons, Defendants request that the Court adopt their proposed claim constructions.

Submitted on behalf of all Defendants

/s/

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